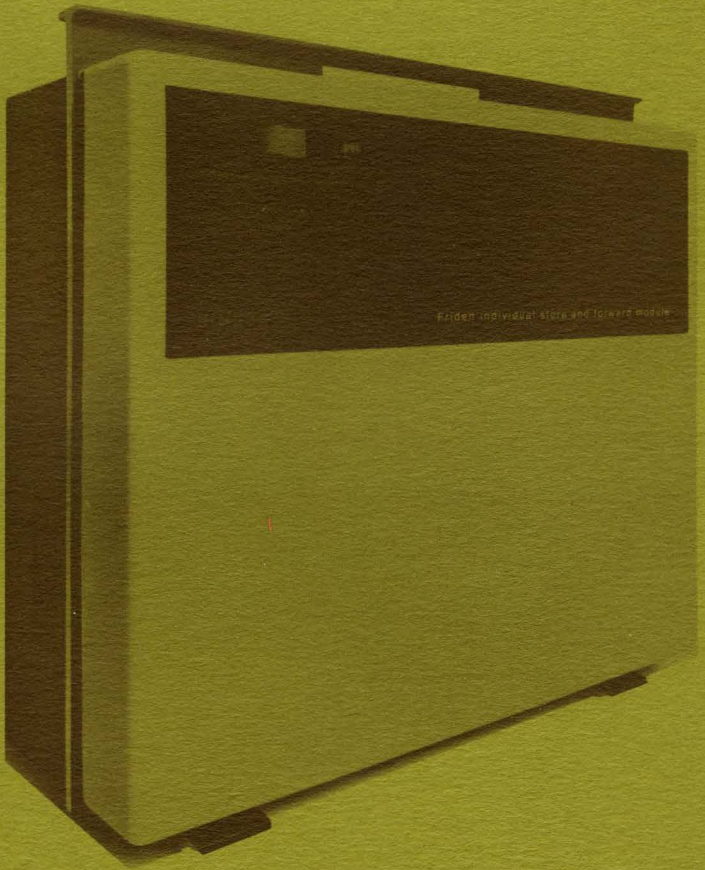
REFERENCE MANUAL

# MODEL 800 INDIVIDUAL STORE AND FORWARD (ISF) MODULE

## MDTS POINT OF SALE SYSTEM



**SINGER**
BUSINESS MACHINES

## REFERENCE MANUAL

# MODEL 800 INDIVIDUAL STORE AND FORWARD (ISF) MODULE

## MDTS POINT OF SALE SYSTEM

Publication No. 40-118
January 1972

**SINGER**
**BUSINESS MACHINES**
2350 WASHINGTON AVE.
SAN LEANDRO, CALIF. 94577

Copyright © 1972, The Singer Company
All rights reserved throughout the world.

PRINTED IN U.S.A.

# PREFACE

This manual describes the Model 800 Individual Store and Forward (ISF) Module. It is directed to managers, programmers, systems analysts, and prospective users who need a basic understanding of the Model 800 ISF.

# LIST OF EFFECTIVE PAGES

| **Page** | **Effective Date** |
|---|---|
| i thru vi | 1/72 |
| 0-1 | 1/72 |
| 1-1 thru 1-4 | 1/72 |
| 2-1 thru 2-5 | 1/72 |
| 3-1 | 1/72 |
| 4-1 | 1/72 |
| 5-1 thru 5-2 | 1/72 |
| 6-1 | 1/72 |

# CONTENTS

Page

INTRODUCTION . . . . . . . . . . . . . . . . . . . . 0-1

Related Documents . . . . . . . . . . . . . . . . . 0-1

1 GENERAL DESCRIPTION . . . . . . . . . . . . . . . 1-1

Indicators . . . . . . . . . . . . . . . . . . . 1-1

Specifications . . . . . . . . . . . . . . . . . 1-2

2 OPERATIONAL DESCRIPTION . . . . . . . . . . . . . 2-1

Basic Principles . . . . . . . . . . . . . . . . 2-1

Magnetic Tape . . . . . . . . . . . . . . . . 2-1
Tape Leader . . . . . . . . . . . . . . . . . 2-2
Single Length Leader . . . . . . . . . . . . . 2-2
Double Length Leader . . . . . . . . . . . . . 2-2
Tape Splice . . . . . . . . . . . . . . . . . 2-2
Single Length Splice . . . . . . . . . . . . . 2-2
Double Length Splice . . . . . . . . . . . . . 2-3
Triple Length Splice . . . . . . . . . . . . . 2-3

Recording the Data . . . . . . . . . . . . . . . 2-3

Transmitting the Data . . . . . . . . . . . . . . 2-4

Repeated Transmissions . . . . . . . . . . . . 2-4

Hang-Up . . . . . . . . . . . . . . . . . . . 2-5

3 DATA CODE AND TRANSMISSION . . . . . . . . . . . 3-1

4 OPERATING INSTRUCTIONS . . . . . . . . . . . . . 4-1

5 MULTIPLE ISF CONFIGURATIONS . . . . . . . . . . . 5-1

6 TROUBLESHOOTING AND DIAGNOSIS . . . . . . . . . . 6-1

Page

ILLUSTRATIONS

Figure 1-1. Model 800 Individual Store and Forward (ISF) Module . . . 1-1
Figure 2-1. ISF Magnetic Tape Arrangement (Schematic). . . . . . . 2-1
Figure 5-1. Multiple ISF Configuration . . . . . . . . . . . . . 5-1

# INTRODUCTION

The Model 800 Individual Store and Forward (ISF) Module is a portable magnetic tape device which receives data from Model 900 Data Terminals, stores and then transmits the data through a data modem to a remotely located computer when the computer requests that data be transmitted. Previously recorded data can be transmitted simultaneously while new data is being recorded.

In appearance the ISF resembles a small suitcase and can be used as a free-standing unit on a floor or shelf, or can be mounted on a wall using a special bracket. A handle on the top of the unit allows it to be carried from place to place.

The ISF is used in the MDTS* point of sale system to store sales transaction data temporarily until it is convenient or desirable for a remote computer to process the data. Since the ISF need not be permanently connected to nor in constant communication with the remote computer, the ISF can be taken with the data terminal to a different location such as an outdoor parking lot sale, the data recorded, and the ISF brought back and reconnected to the data modem for subsequent transmission.

This machine reference manual discusses the Model 800 ISF in six sections.

Section 1, General Description, covers the operational indicators, and specifications which include the modem. In Section 2, Operational Description, the basic principles of the ISF tape and tape cartridge are explained, including information on transmitting the tape data. Data Code and Transmission formats are shown in Section 3. Operating Instructions are in Section 4. Section 5 covers Multiple ISF Configurations including sequence and operation. Section 6 covers Troubleshooting and Diagnosis.

## RELATED DOCUMENTS

For a description of the MDTS network, see the MDTS Installation Planning Guide, Publication Number 40-077.

For information about the data terminal, see the Model 900 Data Terminal Reference Manual, Publication Number 40-202.

---

*A trademark of The Singer Company.

# 1 GENERAL DESCRIPTION

The Model 800 Individual Store and Forward (ISF) Module consists of a drive motor, recording heads, transmitting heads, an endless loop of magnetic tape loosely piled in a cage-like cartridge, and appropriate circuitry to perform all operations. All components are contained within a molded suitcase-like case.

Main power to the ISF is either a nominal single phase 100 volts AC or 220 volts AC from any convenient wall or floor outlet. An independent ground is required.

## INDICATORS

The indicators are located at the top front of the unit (see Figure 1-1) and are visible through a window in the front cover.

Power Switch. Rocker type ON/OFF switch located at the left front of the ISF.

POWER Indicator. This red indicator light is lit when the power is on.

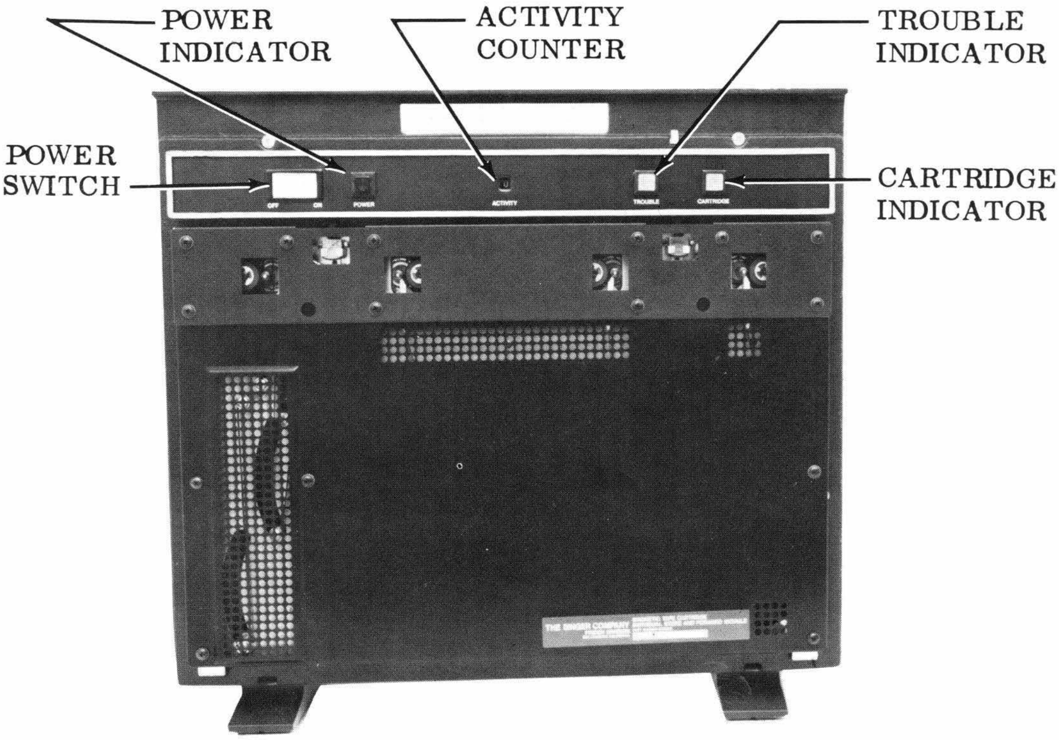


Figure 1-1. Model 800 Individual Store and Forward (ISF) Module (front cover removed)

ACTIVITY Counter. This single digit (0 through 9) counter indicates the number of times the data terminal mode lock switch is turned to CLOSE and an ETX written on the tape. See Operational Description.

TROUBLE Indicator. This white indicator light is lit whenever trouble exists somewhere in the ISF. See Troubleshooting and Diagnosis.

CARTRIDGE Indicator. When this white indicator light is lit, the Singer Customer Service Representative should be called. See Troubleshooting and Diagnosis.

## SPECIFICATIONS

### Dimensions

Length - 19-7/8 inches (50.48 cm)
Width - 7-1/2 inches (19.05 cm)
Height - 18-1/4 inches (46.36 cm)

Weight - 45 pounds (20.39 kg)

### Environment

Operating - +36° through +105°F (+2° through 42°C)
Storage - -35° through +160°F (-37° through +71°C)
Relative Humidity (Operating and Storage) - Ambient 20 to 90%. The atmosphere must be noncondensing.

### Mounting

Integral feet to set unit on floor or shelf; mounting bracket to hang unit on wall in same relative position as when sitting on floor.

### Electrical Requirements

| | | |
|---|---|---|
| Voltage Range | 115V AC ± 11.5V | 220V AC ± 20V |
| Frequency | 60 ± 1 Hz | 50 ± 1 Hz |
| Current (Nominal) | 1.4A | 0.7A |
| Phase | Single | Single |
| kVA | 0.16 | 0.16 |

Power - Main power from a convenient wall or floor outlet must be from a circuit available 24 hours. UL-approved wiring is recommended.

Ground - A true 3-wire ground required. Ground must be non-current carrying; that is, not a neutral. If the equipment ground is not acceptable, run a separate ground wire direct from the main power panel, service ground, or suitable building ground to the receptable ground pin. (NOTE: If a conduit ground is used, every six months measure the resistance from AC common to ground with a volt-ohmmeter. If the resistance is less than 2.4 ohms, the ground is acceptable.)

## Cable Lengths

Power Cord - Approximately 6 feet

Data Modem-to-ISF - 10 feet

ISF-to-ISF - Two cables, one approximately 8 feet long, the other approximately 30 inches long, are supplied. Either cable can be used, or both may be used together.

Terminal-to-ISF - The cable supplied with the ISF is approximately 10 feet long. For distances greater than 10 feet, the cable is to be supplied by the customer. See the Installation and Planning Guide for the MDTS system, Publication Number 40-077, for further cabling information.

## Magnetic Tape

Type - 1/4 inch instrumentation grade, carbon backed

Length - 125 feet ± 5 feet

## Data Arrangement on Tape

Data is arranged on the tape in the following order. Note that many individual sales transactions are usually recorded before the terminal is closed and the ETX written. The ISF can accommodate up to nine ETXs.

STX
individual sales transaction
ETB
interrecord gap (after each ETB)
.
.
.
STX
accumulated totals
ETX
leader
STX (the sequence continues as above)
.
.
.

## Data Recording

Recording Density - 50 characters per inch

Recording Capacity - 50,000 to 55,000 characters

Recording Speed - 2.4 inches per second ± 3% at nominal line voltage

Interrecord Gap Length - 0.65 inches ± 15%

Interrecord Gap Recording Time - 275 milliseconds ±15%

Leader Length - 20.40 inches ± 15%. Can be doubled. See Tape Leader under Operational Description.

Leader Recording Time - 8.5 seconds ± 15%

Tape Splice Length - 20.40 inches ± 15% (same as Leader Length). The splice length can be two to three times the leader length, depending on various conditions (see Tape Splice under Operational Description).

## Data Transmission

Transmission Mode - Asynchronous (bit serial)

Transmission Code - 10 bit ASCII (7 data bits, 1 parity bit to indicate even parity, 1 start bit, 1 stop bit) for each character transmitted.

Data Transmission Rate:

ISF to Data Modem - 108 characters per second

Data Model to ASTA[1] or computer - 120 characters per second

Tape Transmitting Speed (through Transmitting Heads) - 2.16 inches per second ± 3% at nominal line voltage

Interrecord Gap Transmitting Time - 302.5 milliseconds ± 15%

Leader Transmitting Time - 9.35 seconds ± 15%

Tape Splice Transmitting Time - Same as Leader. See Tape Splice Length above.

## Data Modem

A Western Electric 202E9 or equivalent modem with RS-232-B interface.

---

[1] ASTA - Asynchronous-to-Synchronous Transmission Adapter

## BASIC PRINCIPLES

### Magnetic Tape

The ISF magnetic tape arrangement is shown in the schematic representation in Figure 2-1. Note the following:

- The arrangement of the tape and use of separate recording and transmitting heads allows simultaneous recording and transmitting of data.
- The leader length (see Specifications) is sufficient for the distance between the recording and transmitting heads so that the last group of data (ending with ETX) which will be transmitted can be fed completely past the transmitting heads without interfering with the recording of new data.

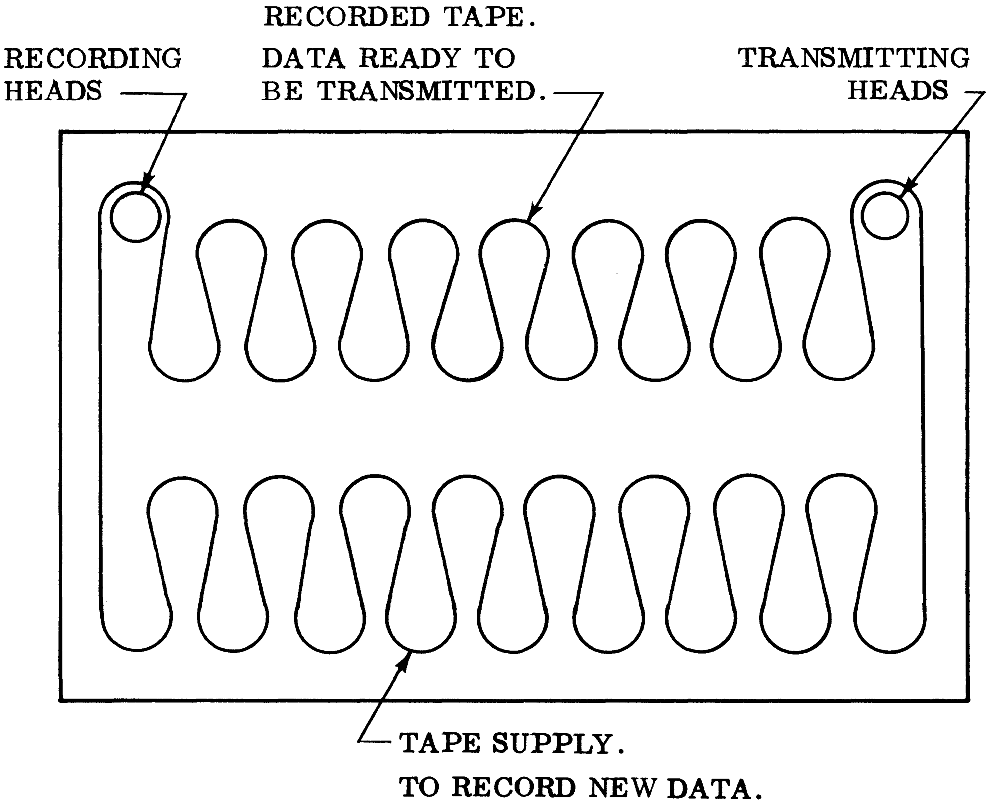

RECORDING HEADS
RECORDED TAPE. DATA READY TO BE TRANSMITTED.
TRANSMITTING HEADS
TAPE SUPPLY. TO RECORD NEW DATA.

Figure 2-1. ISF Magnetic Tape Arrangement (Schematic)

- As data is recorded and the tape supply is exhausted, the taut tape sensing circuit lights the TROUBLE indicator and inhibits recording until the data is transmitted and a supply of tape is again available for recording.

## Tape Leader

The ISF generates a leader after every ETX to ensure that there is sufficient tape between the recording and transmitting heads so that the last group of data which will be transmitted can be fed completely past the transmitting heads without interfering with the recording of new data. Two different leader lengths are possible.

### Single Length Leader

This is the usual length of the leader generated when an ETX is received from the data terminal and when neither a taut tape nor a splice is encountered.

### Double Length Leader

If, while generating a leader, a taut tape condition occurs, tape movement stops until the next data transmission occurs and the ISF transmits an ETX, thus making a supply of tape again available for recording. Then, a new, full-length leader is generated. Since the first attempt to generate a new leader could have been completed when taut tape was sensed, the leader length could be doubled.

## Tape Splice

To ensure that no attempt is made to write data where the magnetic tape is spliced and to ensure that there is sufficient blank tape surrounding the splice, the ISF generates a "tape splice" as follows:

> A short distance before the splice a half-inch of the magnetic material has been removed from the tape. During the tape feed operation the tape passes over a light-emitting sensor circuit and when the light passes through the clear section of the tape, circuits are energized to generate a section of blank tape equivalent to the leader length. This blank tape is referred to as the tape splice. Three different splice lengths are possible.

### Single Length Splice

This is the usual length of a splice (20.40 ± 15%) and occurs when neither a taut tape condition is encountered nor a leader is being generated.

### Double Length Splice

Two conditions can cause the splice length to be doubled. First, if, while generating a leader, the tape splice is encountered, the ISF generates another section of blank tape equivalent to the leader length. Since the attempt to generate the leader can be completed when the splice is encountered, the splice length can be doubled.

Second, if, while generating a splice, a taut tape condition occurs, tape movement stops until the next data transmission occurs and the ISF transmits an ETX, thus making a supply of tape again available for recording. Then, a new full-length splice is generated. Since the first attempt to generate a splice can be completed when taut tape is sensed, the splice length can be doubled.

### Triple Length Splice

If, after a leader is generated, the splice is encountered, and, while generating the splice (see Double Length Splice, first condition, above), taut tape occurs, tape movement stops until the next data transmission occcurs and the ISF transmits an ETX, thus making a supply of tape again available for recording. Then, a new, full-length splice is generated. Since both the leader and the first splice can be full length, the splice length can be tripled. The triple length splice can also occur if, after a leader is generated, both a taut tape and a splice condition occur.

## RECORDING THE DATA

When a data terminal begins transmitting, the voltage on the line to the ISF is raised. This signal initiates the circuits in the ISF to drop the voltage to a predetermined level which allows the data terminal to send sales data. At the same time recording circuits in the ISF are energized, tape is fed through the recording heads, allowing for an interrecord gap, and then the data is recorded.

The magnetic tape has two tracks, one for data and one for clock pulses which synchronize the data when it is being transmitted. Thus, at the same time that data is being written on the tape on the data track, the clock pulses are being written on the clock track.

After an ETB is written, the tape feed mechanism advances the tape a sufficient amount to provide enough tape between the feed arm and the recording heads for the next transaction to be written (approximately 5.2 inches). If the clear section of tape which indicates the presence of the splice is encountered during this feed action, a tape splice is generated.

After an ETX is written, the tape feed mechanism generates a leader. Also, when an ETX is written, the Activity Counter is incremented by one.

## TRANSMITTING THE DATA

To transmit stored data the remote computer calls the ISF through the data modem, thus initiating the ISF transmitting circuits. If the Activity Counter is at zero, there is no data to transmit and the ISF either transmits EOTs or transfers control to the first slave (see Multiple ISF Configurations).
If the Activity Counter is not at zero, the ISF sends SOH to indicate the start of the transmission; at the same time, the tape starts moving through the transmitting heads until the data is transmitted. (NOTE: The time delay between the SOH and the first STX depends on the length of the tape leader and/or splice. See Basic Principles above, and Specifications).

After an ETX is transmitted, the tape stops for 3-1/2 seconds while the ISF waits for a repeat signal from the remote computer (see Repeated Transmissions). If no repeat signal is received, or after the repeated transmissions are completed, there is another 3-1/2 second wait while the Activity Counter is decremented by one. If the Activity Counter is not at zero, the tape is fed until the next data block is encountered and the transmission begins again. This sequence continues until the Activity Counter is at zero. Then the ISF either transfers control to the first ISF slave or sends EOTs if there are no slaves (see Multiple ISF Contigurations), and then goes into a standby condition awaiting another call from the remote computer.

### Repeated Transmissions

During a transmission, the remote computer can request a repeat transmission at any time the message does not meet all specifications. The transmission may be repeated as follows:

- If the repeat request occurs within the first 110 milliseconds of a transaction (before ETB, or in less than the shortest possible transaction), the ISF reverses the tape through the transaction being sent and also through the previous transaction, and then retransmits both the previous transaction and the current transaction.

- If the repeat request occurs after the first 110 milliseconds of a transaction (before ETB), the ISF reverses the tape through the transaction being sent and retransmits that transaction only.

NOTE: If the cause for retransmission is in the shortest possible transaction, a repeat signal cannot return to the ISF in less than 110 milliseconds and would occur in the first transmission after the error. To back up to the error transaction, the ISF must reverse two transactions.

In both cases, the retransmission will occur as often as the remote computer requests it.

If a repeat request is received by the ISF after the ETX is sent (during the 3-1/2 second wait), the ISF reverses the tape through the last transaction (the closing totals) until the ISF detects an interrecord gap and retransmits that transaction only. This retransmission will occur as often as the remote computer requests it.

## Hang-Up

Conditions may occur which cause the remote computer to hang up (disconnect the telephone line) during a transmission. If the computer hangs up, the ISF reverses the tape until a leader is detected, then stops the tape and goes into a standby condition awaiting another call from the remote computer.

# 3 DATA CODE AND TRANSMISSION

The ISF stores and transmits the data exactly as sent by the Model 900 Data Terminal. The ISF does not check parity nor does it alter the data in any way. The data is in a 10-bit ASCII format with 1 start bit, 7 data bits, 1 parity bit (to indicate even parity), and 1 stop bit for each character. See Data Arrangement on Tape under Specifications.

At the beginning of each transmission the ISF transmits SOH to indicate the start of transmission. At the end of transmission the ISF transmits EOTs to indicate that there is no more data to be sent. If the Activity Counter of the ISF is at zero when the ISF is called by the remote computer, only EOTs are sent.

# 4 OPERATING INSTRUCTIONS

## RECORDING THE DATA

To record data, make sure that:

- The ISF Power switch is turned on
- The ISF is connected to a Model 900 Data Terminal
- The front cover of the ISF is on.

## TRANSMITTING THE DATA

To transmit data, make sure the following conditions exist:

- ISF Power switch turned to ON
- ISF connected to data modem
- ISF front cover on
- Data modem plugged in and set to AUTO.

## ISF FRONT COVER

The magnetic tape and the recording and transmitting heads are extremely sensitive to dust and other contamination. Therefore, the ISF front cover should be kept in place at all times except to turn the unit on or off or when removed by a Customer Service Representative.

If the front cover is removed during transmission, a micro switch is released which allows transmission to continue until all data is sent but which then prevents further recording or transmission. If the front cover has been removed before transmission, no transmission or recording can take place.

## ACTIVITY COUNTER

The Activity Counter is incremented by one each time an ETX is written on the tape and is decremented by one each time an ETX is transmitted.

The maximum number of ETXs the ISF can accommodate is nine; therefore, if the Mode lock switch on the data terminal is turned to CLOSE when the ISF Activity Counter reads nine, no data can be transmitted unless a Customer Service Representative manually resets the tape and Activity Counter. If the Activity Counter reaches nine, immediate action should be taken to transmit data from the ISF to the remote computer.

Multiple ISF units can be connected together in series to form one data modem link. In this case, the ISF connected directly to the data modem is called the master and the other ISFs are called slaves. See Figure 5-1.

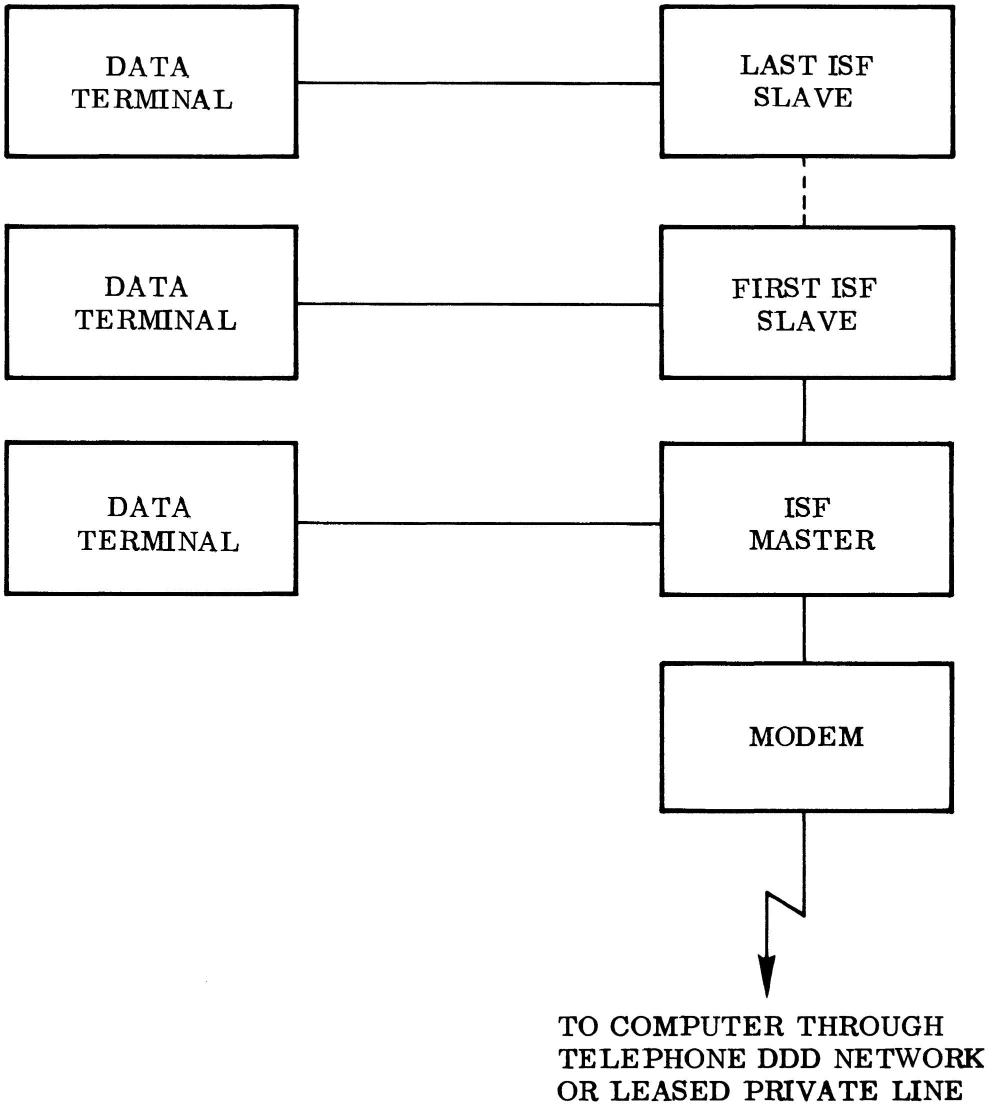


Figure 5-1. Multiple ISF Configuration

During transmission, the master transmits all of its data until its Activity Counter is at zero and then transfers control to the first slave in the series. If the master's Activity Counter is at zero when called by the remote computer, control is passed immediately to the first slave.

Each slave transmits its data until its Activity Counter reads zero and then passes control to the next slave. If a slave has no data to transmit, it passes control to the next slave.

If any ISF malfunctions during transmission, control is passed immediately to the next slave, or the entire series of ISFs goes into a standby condition awaiting the next call from the remote computer if there are no more slaves.

At the end of the entire transmission, whether successful or not, the last ISF sends the EOTs to the remote computer. (NOTE: Each ISF with data to send transmits an SOH signal and the last ISF with data will transmit EOTs when its Activity Counter equals zero.)

# 6 TROUBLESHOOTING AND DIAGNOSIS

Sensor circuits within the ISF detect malfunctions or abnormal conditions and stop all ISF operation until the condition is corrected. The operator is informed of these conditions by the illumination of the TROUBLE and/or CARTRIDGE indicator lights. Conditions which cause the TROUBLE and CARTRIDGE lights to be lit include taut tape, broken tape, and burned out sensor bulbs inside the ISF.

As a general rule, a Customer Service Representative should be called when either of the following conditions exist:

- TROUBLE and CARTRIDGE lights illuminated together.
- TROUBLE light illuminated alone and not extinguished after data has been transmitted.
- CARTRIDGE light illuminated when the Activity Counter is at zero. If the CARTRIDGE light is illuminated when the Activity Counter is at 1, make sure that the ISF is polled by the remote computer as soon as possible.

# REFERENCE MANUAL
# MODEL 800 INDIVIDUAL STORE AND FORWARD (ISF) MODULE
## Publication No. 40–118

We produce manuals for you, and we want you to find them useful and informative. That's our job.

So we're asking you to help us furnish you with the best possible publications. Please take a few minutes to answer the following questions. Add any comments you wish. If you desire a reply to any question, be sure to include your name and address.

Thank you.

DETACH HERE

- Does this manual meet your needs? Yes ☐ No ☐
  If not, what additional information would be of help to you?

- Can you find what you're looking for quickly and easily? Yes ☐ No ☐
  How can the organization be improved?

- Is the material easy to read and to understand? Yes ☐ No ☐
  Are there enough illustrations to support the text? Yes ☐ No ☐
  Comments

- Did you find any errors or ambiguities in the manual? Yes ☐ No ☐
  If yes, please cite page, line, and/or figure number with your comments.

- Other comments.

- What is your relationship to the product described?
  - ☐ Operator.
  - ☐ Programmer.
  - ☐ Other (please specify)

**SINGER**
**BUSINESS MACHINES**

STAPLE STAPLE

FOLD BACK

FIRST CLASS
PERMIT No. 320
San Leandro, Calif.

**BUSINESS REPLY MAIL**
**No postage stamp necessary if mailed in the United States**

**POSTAGE WILL BE PAID BY**

FRIDEN DIVISION
THE SINGER COMPANY
2350 Washington Ave.
San Leandro, California 94577

Attn: Customer Technical Publications,
Department 753

FOLD BACK

SINGER
BUSINESS MACHINES

Publication No. 40-118